Received February 12, 1767.

XIX. *Deſcription of an improved Apparatus for performing Electrical Experiments, in which the Electrical Power is increaſed, the Operator intirely ſecured from receiving any any accidental Shocks, and the whole rendered more convenient for Experiments than heretofore: By* C. L. Epinaſſe, *F.R.S.*

Read March 12, 1767.

I. THE firſt method of improvement conſiſts in lining the inſide of the glaſs cylinder or globe with the following compoſition.

Take 4 ℔ of Venice turpentine, 1 ℔ of reſin, 1 ℔ of bee's wax; boil theſe over a gentle fire, ſtirring them now and then, for about four hours, at the end of which, ſtirr in a quarter of a pound of vermilion: then, a little of the mixture being taken out and left to cool, will be hard and brittle; a token that it is fit for uſe. Having well heated your globe or cylinder, pour the melted mixture into it; turn the cylinder about ſo as to ſpread it evenly over the inſide ſurface to the thickneſs of a ſixpence, and let it cool very gradually.

The advantages that reſult from this are as follow.

1ſt, Upon repeated trials I have conſtantly found, that a cylinder thus lined acted with much greater force

force than it did before it was lined, every other circumſtance alike. When firſt I made this obſervation, it induced me to try what effect the lining would have upon ſome cylinders, which I had found ſo bad that I had laid them aſide as uſeleſs.

Upon being lined, they proved much better than any I ever had of the ſame ſize before.

2dly, Electrical machines, when laid by for any conſiderable time, are very apt to be out of order, and ſometimes require much trouble before they can be brought to act: this inconvenience is in a great meaſure removed by thus lining the glaſs.

3dly, The cylinders thus lined are by far leſs liable to break by any alteration of weather, or in working the machine, which often was the caſe with mine before I lined them.

4thly, As a ſmall cylinder thus prepared is equal in power to one much larger, that is not, and requires leſs friction, the apparatus in which it is mounted may be much contracted, and the whole, together with the perſon that turns the machine, may be eaſily ſupported upon one or two ſmall ſtools with glaſs feet, when experiments require it. With a lined cylinder $7\frac{1}{2}$ inches in diameter, and, about 9 inches long, I have loaded three jars, that held four gallons each, to that degree as to burſt one of them, which made an exploſion near to that of a pocket piſtol. The cylinder was mounted in a braſs frame with a wheel and pinion; the wheel was turned with eaſe by a ſmall braſs winch, and the rotation of the winch to that of the cylinder was as one to three.

II. As raiſing the greateſt quantity of electrical fire was the object of the firſt improvement, the next

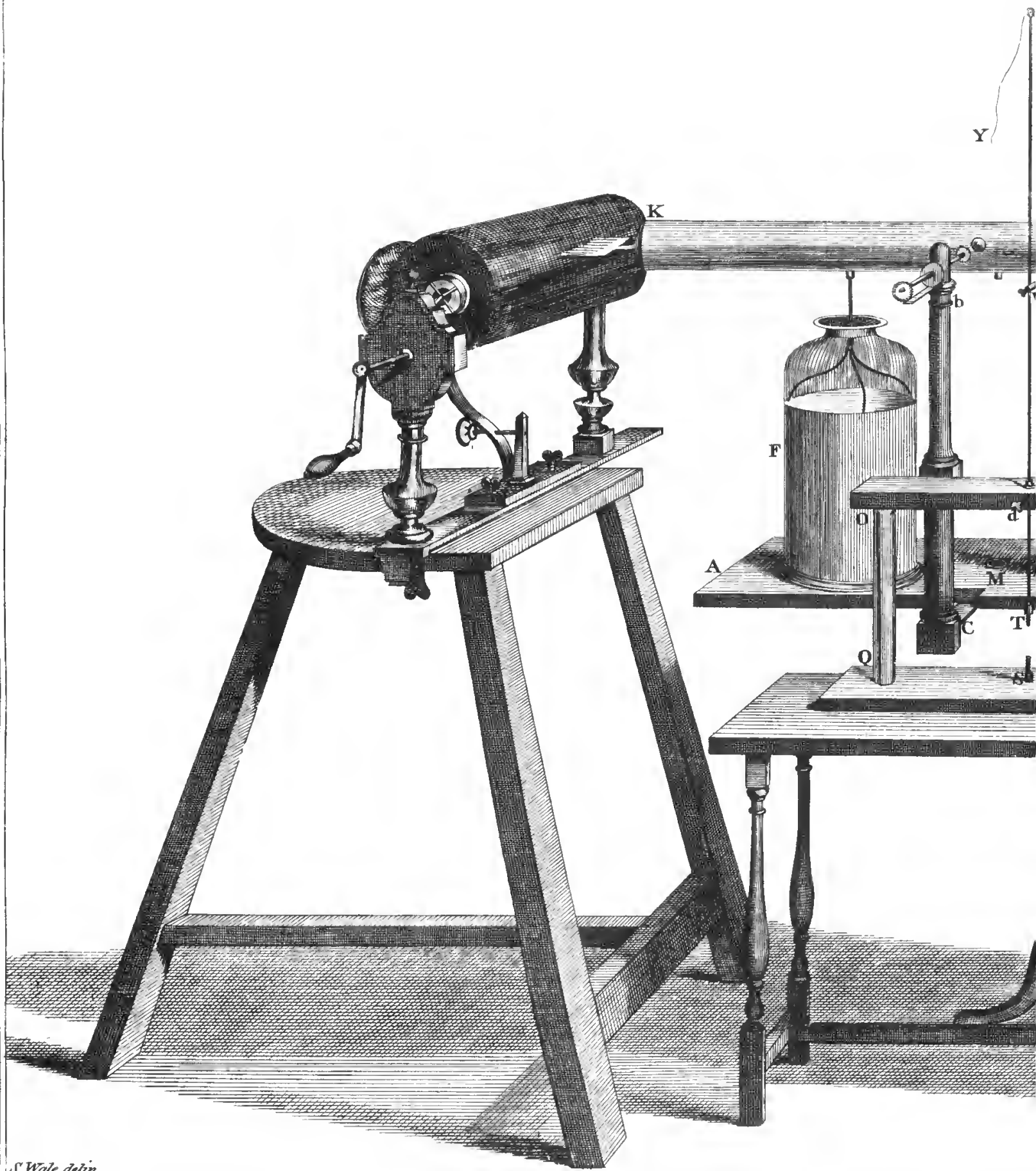
thing was, to preſerve it when raiſed, and uſe it without waſting any, ſo that it might have its full effect. I had obſerved, that whenever a ſingle wire was made uſe of inſtead of a chain in diſcharging the jars, the effect was much ſtronger; and upon making further experiments, I found that when the diſcharging parts were not all in cloſe contact, ſuch as being ſcrewed tight together, or ground into one another, the effect was conſiderably diminiſhed. In conſtructing the diſcharging apparatus, I therefore contrived that all the parts ſhould be in cloſe contact, by ſcrewing grinding, or ſoldering, them together; and thus the electrical fire exerts its whole force on the body upon which the experiment is made.

III. Laſtly, it often happened in diſcharging the jars when loaded very high (as they muſt be to kill a large animal, or to force the fire through bodies that make a great reſiſtance), that the perſons operating, notwithſtanding all their ſkill and care, received the whole or part of the ſhock. This has deterred many from repeating ſeveral uſeful experiments, and has intimidated others that attempted to repeat them ſo as to make them fail of their effect. To remove this inconvenience intirely, the diſcharging frame is contrived, which, at the ſame time that it prevents the waſting of the electrical fire, leaves no poſſibility of the operator's ever receiving any ſhock. This will plainly appear upon inſpecting the figure annexed.

Explanation *of* Tab. XI.

AB, a mahogany board $4\frac{1}{2}$ feet long, which ſupports the jars F, G, H, and the conductor KL.

This



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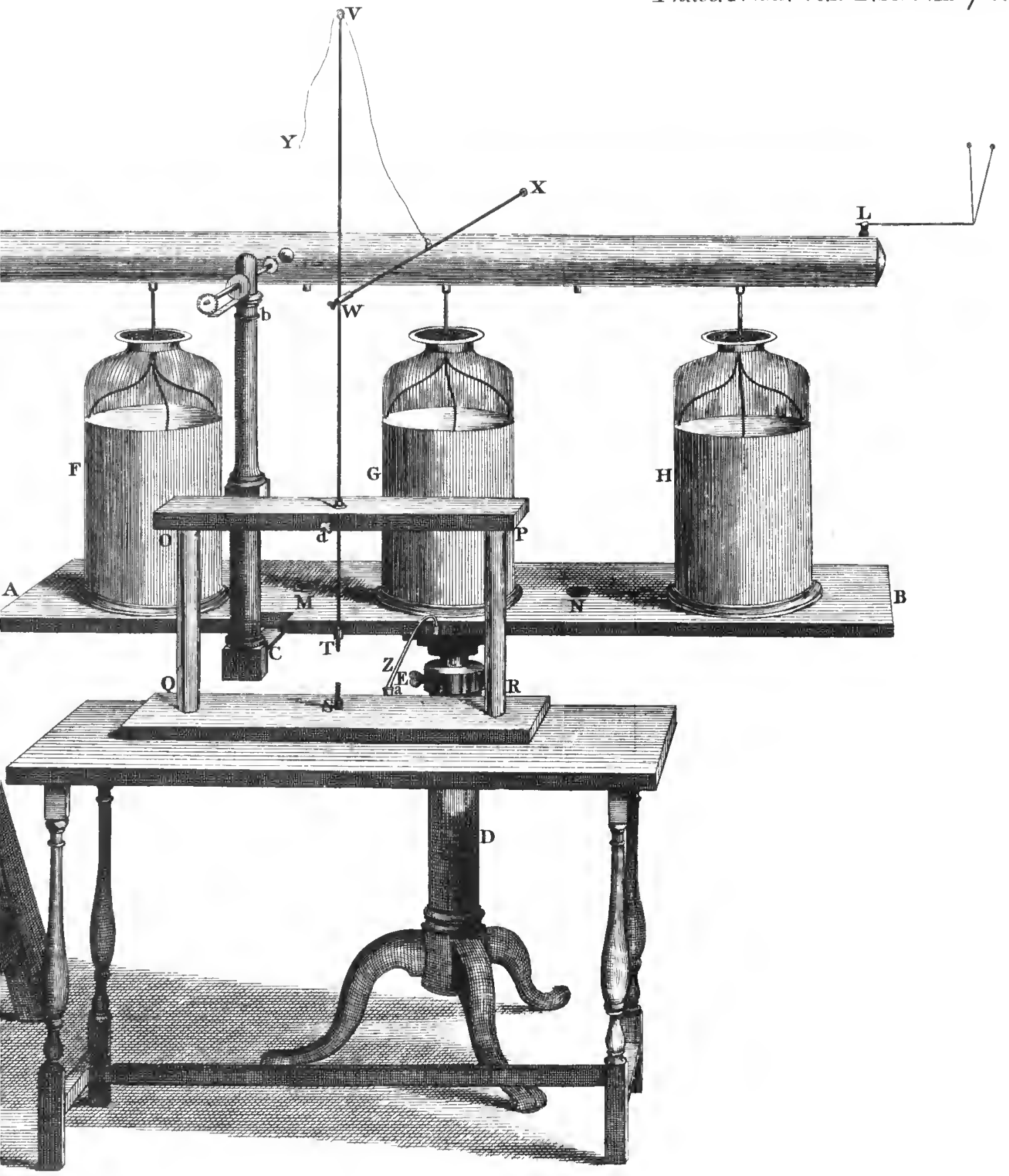


J. Myers sculp.

This board has three large holes cut through it, to fit the three jars: over theſe holes, on the under ſide of the board, are nailed three tin plates, which communicate to one another by a ſlip of tin, and upon which the bottom of the jars reſt. Under the middle of this board is alſo fixed by a wooden ſcrew a cylindrical piece of wood *c*, which moves up and down in the hollow of the clawed pillar D, and may be ſtopt at any height by means of the ſcrew E; ſo that the whole apparatus can be raiſed to a height ſuitable to any electrical machine to which it is applied.

F, G, H, three glaſs jars, about ten inches diameter, and fourteen inches high, lined inſide and out with tin foyl to about two thirds of their height. A piece of wood is cemented at their top, through which there paſſes a thick braſs wire, one end of which fits into a ſocket ſoldered to the conductor, and to the other end within the jar are fixed ſmall wires, which ſpread and form a communication between the inſide lining of the jars and the conductor.

KL, the conductor, a tin tube about five feet long and three inches in diameter, cloſed and rounded off at each end. At the end next the machine is fixt a piece of braſs made of pointed wires in the ſhape of a comb, which collects the electrical fire from the machine; at the other end is fixt a ſlight piece of mahogany, at the end of which two ſmall cork balls are ſuſpended by fine threads, which balls by receding from each other, ſhew to what degree the power is raiſed; and when the jars are fully condenſed will ſtand nearly upright as in the figure.

When experiments require to draw a ſpark from the conductor without a ſhock, which we may call ſingle

ſingle ſparks, the jars are then removed, and the conductor is ſupported by two glaſs pillars, ſuch as are uſed in the diſcharging apparatus; one end of which fits into holes made in the board at M and N, and the other end having a wire fixt to it, ſupports the conductor.

OPQR, the diſcharging frame placed on a table, and conſiſting of the following pieces.

QSR, a mahogany board twenty inches long and ſeven broad: about the middle of this board a narrow braſs plate is let into the thickneſs of the wood, reaching from S to *a*. At the extremity *a*, which projects out of the board, there is a loop into which the end of the bent wire Z is fitted by being ground into it, the other extremity receives the end of the nut S.

S, a braſs nut made with a double ſcrew, the lower end being a male ſcrew, to faſten it to the braſs plate; and the upper end a female ſcrew, to receive the ends of different wires and other pieces which fit into it for performing various experiments.

OQ, PR, two glaſs pillars about twelve inches long and an inch thick, made with ſhoulders at the end, which fit into the board QR, and the rail OP.

OP, a mahogany rail three inches broad and $1\frac{1}{2}$ thick, nearly the ſame length with the board QR, which receives the upper ends of the glaſs pillars.

TV, a thick braſs wire, which paſſes through the middle of the rail, and, by means of a ſcrew at *d*, may be ſtopt at any height. At the upper end V of this wire is a loop, and at the lower end T a ſcrew, to which pieces are fixt to anſwer thoſe in the nut S.

W, a ſolid piece of braſs, through which the upright wire TV paſſes, which may be ſhifted to any part

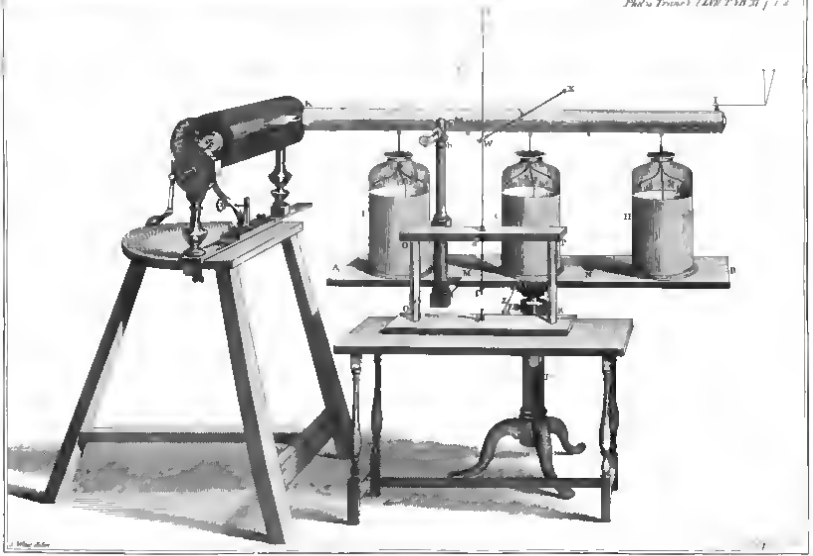
part of this wire ſuitable to the height of the conductor, and fixt there by a ſcrew. A croſs wire WX is fixt to this piece with a moveable joint towards W, ſo that it may be drawn up or let down by the ſilk ſtring Y; one end of which is fixt to the croſs wire, and the other end paſſes through the loop V.

X, a ſmall braſs knob at the end of the wire.

Z, a bent wire, which forms the communication between the diſcharging frame and the outſide coating of the jars; one end of this wire is ground into a braſs loop at *a*, and the other into a loop of the ſame kind at *e*, which is ſoldered to the tin plate that lies under the jars.

b C, an electrometer, which may be fixt on occaſionally. When the diſcharging frame is uſed, the body upon which the experiment is made is placed between the nut S, and the end T of the upright wire, which is brought into contact with it; then the wire WX is drawn up to an erect poſition; and, after the jars are ſufficiently loaded, it is let down upon the conductor by the ſilk ſtring Y, and diſcharging the jars, the electrical ſpark in forming the circle paſſes through the body. Care muſt be taken to keep the glaſs pillars dry and clean, that none of the fire be waſted.

When an animal is to be killed, he muſt be faſtened to a board, and his head placed between the two points S, and T. If the diſcharging frame be removed, the apparatus may be uſed in medical caſes as uſual; either with an electrometer or without.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